

REMARKS

This is a full and timely response to the non-final Office Action dated November 3, 2005. The present Amendment amends claims 2, 3, 5, 6, 14, and 15 and cancels claims 1, 4, 7-13, and 16 in order to further clarify a portion of the scope sought to be patented, and otherwise disputes certain findings of fact made in connection with the rejection of the claims. Support for these amendments can be found variously throughout the specification, including, for example, original claims 2 and 3, and Paragraph [0030]. No new matter has been added. Accordingly, claims 2, 3, 5, 6, 14, 15, 17, and 18 are presently pending in the application, each of which is believed to be in condition for allowance. Reexamination and reconsideration in light of the present Amendment and the following remarks are respectfully requested.

Claim to Priority

Acknowledgement of the proper receipt of the certified formal papers filed in connection with Applicant's claim to priority under 35 U.S.C. § 119(a)-(d) is noted with appreciation.

Information Disclosure Statement

It appears that the Examiner has reviewed the appropriate U.S. and foreign patent documents cited in the International Search Report, which search report was cited in the February 27, 2004 IDS. Additionally, the Examiner is correct in noting that the Patent Literature references cited in the May 13, 2004 IDS are identical to the references cited in the February 27, 2004 IDS. We have enclosed an IDS concurrently with this Amendment along with a copy of the WPI Abstract for the Examiner's review.

Title

At the examiner's request, Applicant proposes amending the Title of the present invention to read: "A SLIDING MEMBER AND A SLIDING COMPOSITION HAVING A THERMOSETTING RESIN, POLYTETRAFLUOROETHYLENE, AN ALKALINE EARTH METAL SALT, AND BISMUTH AND/OR A BISMUTH ALLOY." If, however, the examiner feels the proposed Title fails to aptly describe the invention to which the claims are directed, the examiner may amend as necessary.

Specification & Abstract

The specification has been amended to remove Paragraph [0019], in order to correct a minor matter of form. The subject matter contained in Paragraph [0019] can also be found in Paragraph [0021]. The Abstract has additionally been amended per the examiner's request to place the abstract in better form. Finally, under the CLAIMS heading, the preface to the claims has been revised to read "We claim." Entry of these changes, involving minor matters not involving new matter, is respectfully solicited.

Claim Rejections- 35 U.S.C. § 112

In the Action, claims 1-18 are rejected under 35 U.S.C. § 112, second paragraph, for alleged indefiniteness. Applicant respectfully traverses this rejection. However, in order to expedite prosecution, claims 2 and 3 have been revised to indicate that the average molecular weight of the polytetrafluoroethylene (PTFE) is in fact a **number average molecular weight**.

In support of polytetrafluoroethylene being measured in terms of number average molecular weight, the Applicant has included a brochure published by Mitsui Dupont Fluorochemicals Co., Ltd. A partial translation of the brochure is provided, and describes the method used by Mitsui Dupont Fluorochemicals in determining the number average molecular weight of PTFE. The copy of the brochure and the partial translation are included in the appendix.

Paragraph [0029] on page 9 indicates that a PTFE powder manufactured by Mitsui Dupont Fluorochemicals Co., Ltd. and having a molecular weight of 3,000,000 or more was used in the experiments.

Withdrawal of this rejection is therefore courteously solicited.

Claim Rejections- 35 U.S.C. § 103

In the Action, claims 1, 4, 7, 10, 13, and 16 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Publication No. GB 2 358 866 to Niwa et al. ("Niwa"), in view of U.S. Patent No. 5,948,737 to Srinivasan et al. ("Srinivasan") and Publication No. GB 2 337 306 to Tsuji et al. ("Tsuji"). Additionally, claims 2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, and 18 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Niwa, in view of

Srinivisan and Tsuji, and further in view of U.S. Patent No. 3,909,424 to Clark ("Clark"). These rejections are respectfully traversed.

Claims 1, 4, 7, 8, 9, 10, 11, 12, 13, and 16

Claims 1, 4, 7, 8, 9, 10, 11, 12, 13, and 16 are canceled in this amendment without prejudice or disclaimer as to their underlying subject matter.

Claims 2, 3, 5, 6, 14, 15, 17, and 18

According to Federal Circuit precedent, the burden of establishing a *prima facie* case of obviousness under 35 U.S.C. § 103 rests squarely on the shoulders of the Examiner. *In re Rinehart*, 531 F.2d 1048, 1052 (C.C.P.A. 1976); *accord*. MPEP 2142. To establish a *prima facie* case of obviousness, three basic criteria must be met.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *See, e.g., Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985) ("To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references"); *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987) ("When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references"; *ACS Hosp. Sys. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984) ("Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination"); *accord*. MPEP 2143.

Second, there must be a reasonable expectation that the proposed modifications or combination would be successful. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097, 231 USPQ 375 (Fed. Cir. 1986); *accord*. MPEP 2143.02.

Third, the prior art reference (or references when combined) must teach or suggest each and every claim limitation. *See, e.g., In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974); *accord*. MPEP 2143.03.

With respect to the third element of a *prima facie* case of obviousness, independent claims 2, 3, 14, and 15 teach, *inter alia*, a **sliding member** obtained by coating a substrate with a sliding composition comprising 50 to 80 vol% of a thermosetting resin, 10 to 40 vol% of a polytetrafluoroethylene having a number average molecular weight of 3,000,000 or more and an **average particle size of 300 to 600 μm** and 1 to 20 vol% of an **alkaline earth metal salt**.

On the other hand, Srinivasan does not at all disclose, teach, or even suggest that the **PTFE has an average particle size of 300 to 600 μm** . Srinivasan merely discloses an average particle size range of from 4 to 10 μm (*see* column 2, lines 53-61 of Srinivasan), which is not even in the same order of magnitude as the average particle size range disclosed in the present application.

Also, Srinivasan does not even suggest that PTFE would prove suitable for use in a sliding member.

Additionally, Clark does not at all disclose, teach, or even suggest the use of alkaline earth metal salts. Clark on arguably discloses resins such as alkali metal salts.

Alkali metals are the series of elements in **Group 1** (IUPAC style) of the periodic table, excluding hydrogen: lithium (Li), sodium (Na), potassium (K), rubidium (Rb), caesium (Cs), and francium (Fr). **Alkaline earth metals**, on the other hand, are the series of elements in Group 2 (IUPAC style) of the periodic table: beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba) and radium (Ra). Group I and Group II elements, and compositions incorporating those elements, are very different in properties and function. Therefore, alkaline earth metal salts are not anticipated or obvious in view of the alkali metal salts disclosed by Clark.

Accordingly, because Niwa, Srinivasan, Tsuji, and Clark, either alone or in combination, fail to disclose, teach or suggest each and every limitation of claims 2, 3, 14, and 15 a *prima facie* case of obviousness has not been established, and withdrawal of the rejection of these claims is respectfully requested. *See, e.g., In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974); *accord*. MPEP 2143.03.

With respect to the first element of a *prima facie* case of obviousness, it is established law that one “cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.” *Ecolchem, Inc. v. Southern Cal. Edison*

Co., 227 F.3d 1361, 1371, 56 USPQ2d 1065 (Fed. Cir. 2000) (citing *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1780, 1783 (Fed. Cir. 1988)). Indeed, “[c]ombining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight.” *In re Dembiczak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999).

In the Office Action, it is alleged that it would be obvious to combine the thermosetting or PTFE resin and solid lubricant of Tsuji with the PTFE base resin and lubricant disclosed in Niwa. However, even if one were to combine the art of Tsuji with that of Niwa, one would not reach the present invention wherein there are used a thermosetting resin as the base resin, PTFE having a number average molecular weight of 3,000,000 or more and an average particle size of 300, to 600 μm .

In order to cure the above deficiency, the Office Action attempts to show that one skilled in the art of solid lubricants would be inclined to use PTFE compounds disclosed in Srinivisan, which is drawn to the very different art of greases. As shown above, the compounds used in the present invention are not disclosed in the present invention. Additionally, there is no reason one would be inclined to combine a compound used in a grease composition, with a solid lubricant composition. The Office Action never even suggests any motivation for the alleged combination, it being admitted in the Action that Srinivasan is drawn to greases rather than solid lubricants.

Further, while the present invention discloses an average PTFE having an average particle size of 300 to 600 μm , Tsuji merely discloses a resin layer having a thickness of 2-20 μm (*see* page 3, line 16). Therefore, there is no motivation for one skilled in the art to use a large particle size PTFE in the invention disclosed by Tsuji, which combination would destroy an essential element disclosed by Tsuji.

Finally, Niwa uses PTFE as a base resin while the present invention uses a thermosetting compound as a base resin. Therefore, there is no motivation for one skilled in the art to combine a thermosetting resin with the PTFE of Niwa in an amount in which the thermosetting resin is the base resin rather than the PTFE resin.

With respect to second element of a *prima facie* case of obviousness, there would not be a reasonable expectation that the proposed modifications or combination would produce the unexpected and superior results obtained by the present invention.

By the use of the thermosetting resin as a base resin, good heat resistance, wear resistance, and mechanical strength are attained. Also, by use of the PTFE having the specific number average molecular weight and average particle size, good wear resistance and formation of a film by transfer of a composition are attained. Further, by use of the alkaline earth metal salt, good formation of a film by transfer of a composition and wear resistance can be attained. The above combination of the elements in the present invention yields synergistic properties, wherein a sliding member which exhibits excellent sliding properties is obtained (see Table 1 and Table 2 of the present invention).

Aside from the novel limitations recited therein, claims 5, 6, 17, and 18, being dependent either directly or indirectly upon allowable base claims 2, 3, 14, and 15, are also allowable for at least the reasons set forth above. Withdrawal of the rejection of these claims is therefore courteously solicited.

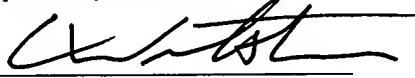
CONCLUSION

For at least the foregoing reasons, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the examiner is respectfully requested to pass this application to issue. If the examiner has any comments or suggestions that could place this application in even better form, the examiner is invited to telephone the undersigned attorney at the below-listed number.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 18-0013, under Order No. ASA-0014 from which the undersigned is authorized to draw.

Dated: April 3, 2006

Respectfully submitted,

By 

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Sliding material

Patent Number: ☐ US2001016265
Publication date: 2001-08-23
Inventor(s): NIWA TAKAHIRO (JP); IWATA HIDEKI (JP); HIRAMATSU NOBUTAKA (JP); SHIBAYAMA TAKAYUKI (JP)
Applicant(s):
Requested Patent: ☐ JP2001221231
Application Number: US20000735996 20001214
Priority Number (s): JP20000026671 20000203
IPC Classification: B32B15/08; B32B3/24; B32B5/16; F16C33/20; F16C33/28
EC Classification: C08K3/08+L27/18
Equivalents: ☐ GB2358866, ☐ US6465089

Abstract

In order to obtain a sliding material which does not include lead particles and is harmless to the environment, there is provided a sliding material which includes, by volume, 3 to 40% bismuth particles but no lead particles, while having a low coefficient of friction and excellent wear resistance

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Claims

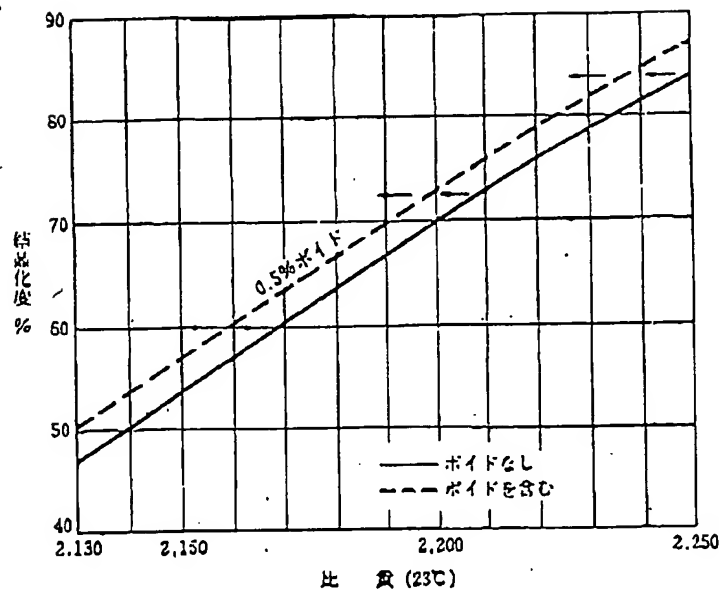
What is claimed is:

1. A sliding material comprising a polytetrafluoroethylene resin, wherein the resin includes, by volume, 3 to 40% bismuth particles but no lead particles.
2. A sliding material according to claim 1, wherein the bismuth particles are bismuth alloy particles.
3. A plain bearing comprising a back metal, wherein the inner surface of the back metal is coated with the sliding material according to claim 1.
4. A plain bearing comprising a back metal, wherein the inner surface of the back metal is coated with the sliding material according to claim 2.
5. A plain bearing comprising a back metal, wherein the inner surface of the back metal is provided with a metal powder layer sintered thereon, and the inner surface of the metal powder layer is impregnated and coated with the sliding material according to claim 1.
6. A plain bearing comprising a back metal, wherein the inner surface of the back metal is provided with a metal powder layer sintered thereon, and the inner surface of the metal powder layer is impregnated and coated with the sliding material according to claim 2.

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Brochure of PTFE

図4 結晶化度と比重の関係 (PTFE)



2-4 アニーリング

フリーシンターして徐冷した成形品には応力歪が存在しないが、コイニング（金型に入れてシンターし、加圧冷却）したり、外層が急冷された成形品には、いろいろな応力歪が内在している。金型に入れて加圧冷却した部品には、最大の応力歪が内蔵している。もしも変形が問題となるような高温で使用されるとか、公差を小さくするために機械加工しなければならないときには、事前にアニールする方がよい。

アニーリングとしては、成形品の厚さ1cmにつき30分の割合で290℃に保持し、その後ゆっくり冷却する（大きさにもよるが10～55℃/hr）。最高使用温度が260℃以下であることがわかっている場合には、アニーリングの温度は使用温度より50℃高くする。

特定の寸法に合わせるためにコイニングまたは後成形した成形品は、アニーリングのときに予備成形の形に戻ろうとするので、このような成形品を使用する場合には使用温度に限界がある。

2-5 分子量

一般に、PTFEの粉末はASTMで規定された焼成条件で作られた成形品の標準比重SSG (Standard Specific Gravity)は、2.15～2.21程度である。

この標準比重 (SSG) とPTFEの数平均分子量 [Mn] との関係は次式で示される。

$$SSG = -0.0579 \log [Mn] + 2.6113$$

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ふっ素樹脂 PTFE, PFA, FEP

テフロン実用ハンドブック

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1999年(平成11年)8月改訂

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テフロン®開発

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2-5 Molecular weight

In general, when PTFE powder is molded under a calcination condition prescribed in ASTM, the resulting molded article has a standard specific gravity of approximately 2.15 to 2.21.

The relation between this standard specific gravity (SSG) and the number average molecular weight [Mn] of PTFE is presented by the following formula.

$$\text{SSG} = -0.0579 \log[\text{Mn}] + 2.6113$$

• Colophon page

Teflon® Practical Handbook

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Co., Ltd.